2-2 Identifying Functions from Graphical Patterns

One way to tell what type of function fits a set of points is by recognizing the properties of the graph of the function.

Objective

Given the graph of a function, know whether the function is exponential, power, quadratic, or linear and find the particular equation algebraically.

Here is a brief review of the basic functions used in modeling. Some of these appeared in Chapter 1.

Linear and Constant Functions

General equation: $y = ax + b$ (often written $y = mx + b$), where a (or m) and b stand for constants and the domain is all real numbers. This equation is in the **slope-intercept form** because a (or m) gives the **slope** and b gives the y-intercept. If $a = 0$, then $y = b$; this is a **constant function.**

Parent function: $y = x$

Transformed function: $y = y_1 + a(x - x_1)$, called the **point-slope form** because the graph contains the point (x_1, y_1) and has slope a. The slope, a, is the vertical dilation; y_1 is the vertical translation; and x_1 is the horizontal translation. Note that point-slope form can also be written $y - y_1 = a(x - x_1)$, where the coordinates of the fixed point (x_1, y_1) both appear with a $-$ sign. The form $y = y_1 + a(x - x_1)$ expresses y explicitly in terms of x and thus is easier to enter into your grapher.

Graphical properties: The graph is a straight line. The parent function is shown in the left graph of Figure 2-2a, the slope-intercept form is shown in the middle graph, and the point-slope form is shown in the right graph.

Verbally: For slope-intercept form: "Start at b on the y-axis, run x, and rise ax." For point-slope form: "Start at (x_1, y_1), run $(x - x_1)$, and rise $a(x - x_1)$."

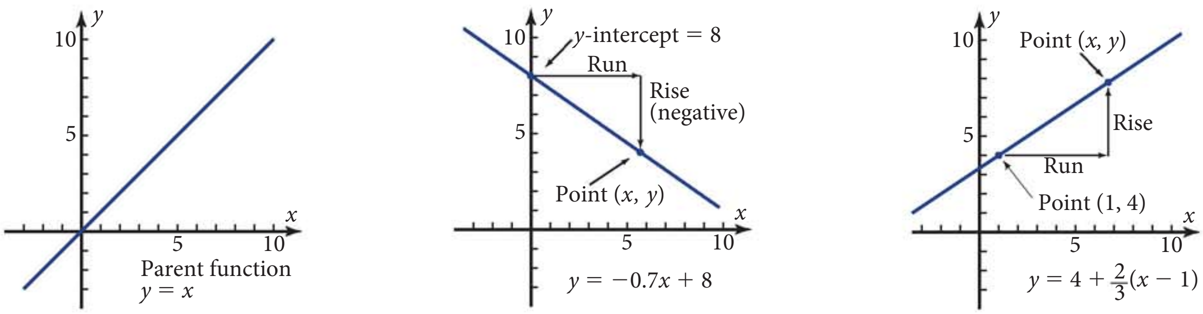

Figure 2-2a: Linear functions